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**PROFILE OF
CIVILIAN SCIENTISTS AND ENGINEERS
IN FIELD RDT&E ACTIVITIES
OF THE DEPARTMENT OF DEFENSE**



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Management Analysis Report . . .

Office for Laboratory Management

**Office of the Director of Defense
Research and Engineering
Washington, D.C. 20301**

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1 July 1969

E. C. Haberman
E. M. Glass

Management Analysis Report 69-1
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INTRODUCTION

This profile is based upon a survey of the scientists and engineers (S&E) in field research, development, test and evaluation (RDT&E) activities of the Department of Defense—primarily laboratories, test centers and ranges. These activities do not include headquarters or system/project offices. The information was provided by individual scientists and engineers and was forwarded by the organizations involved to the Office for Laboratory Management, Office of the Director of Defense Research and Engineering. The effective date of the information is 1 September 1968.

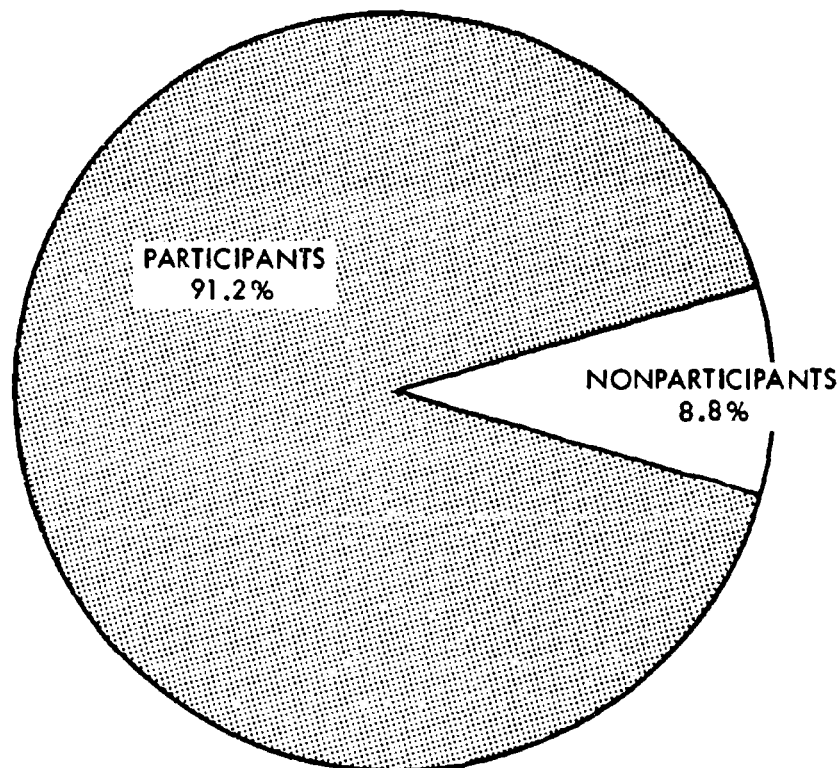
Programing support was provided by the U.S. Air Force's OSD Information Systems Division, chiefly by Spec. 4 Richard Hein. Beth R. King furnished editorial assistance, and the graphic arts work was done by Robert B. Logan and his associates of the Graphics and Presentations Branch, Office of the Assistant Secretary of Defense (Administration).

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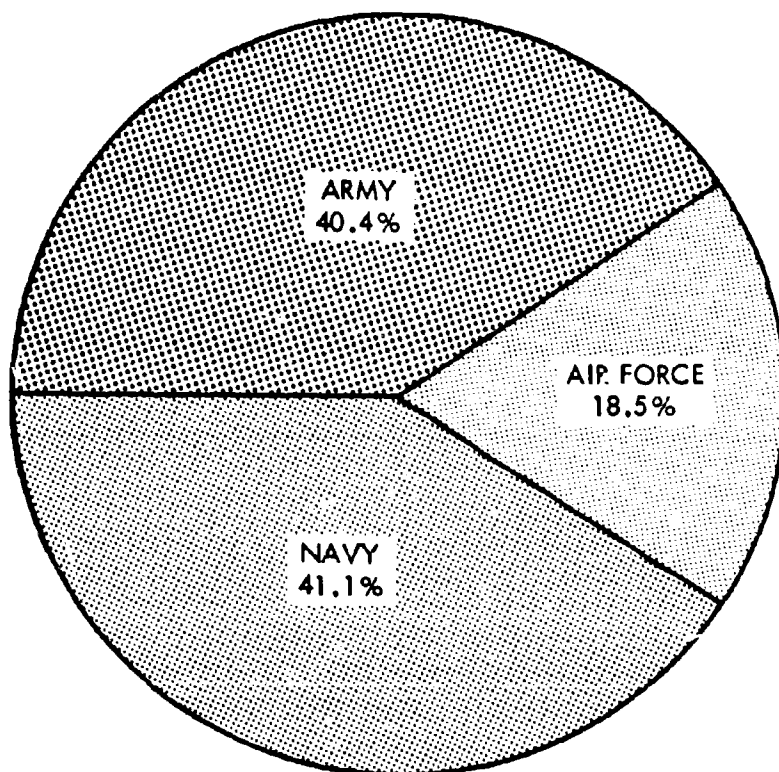
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PARTICIPATION IN THE SURVEY

The information for this survey was provided by 26,437 civilian employees of the Department of Defense (DoD). This represents 91.8 percent of the authorized strength of the DoD civilian scientific and engineering work force of the RDT&E activities surveyed. These civilian DoD employees make up 80 percent of the entire scientific and engineering work force in these activities.



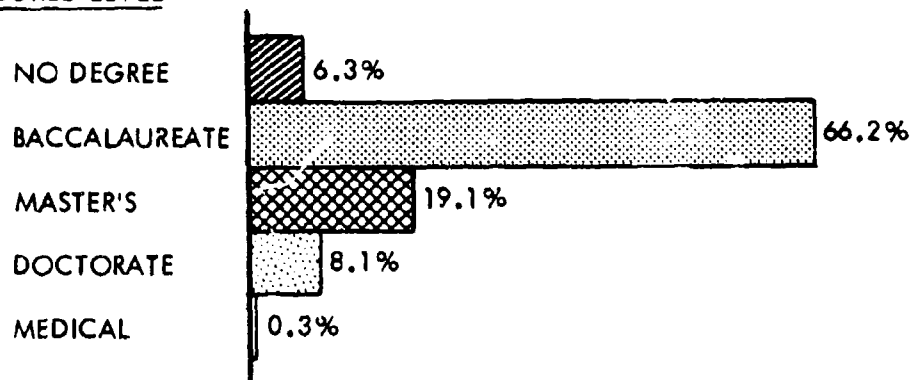
Distribution by Military Department



EDUCATIONAL LEVELS

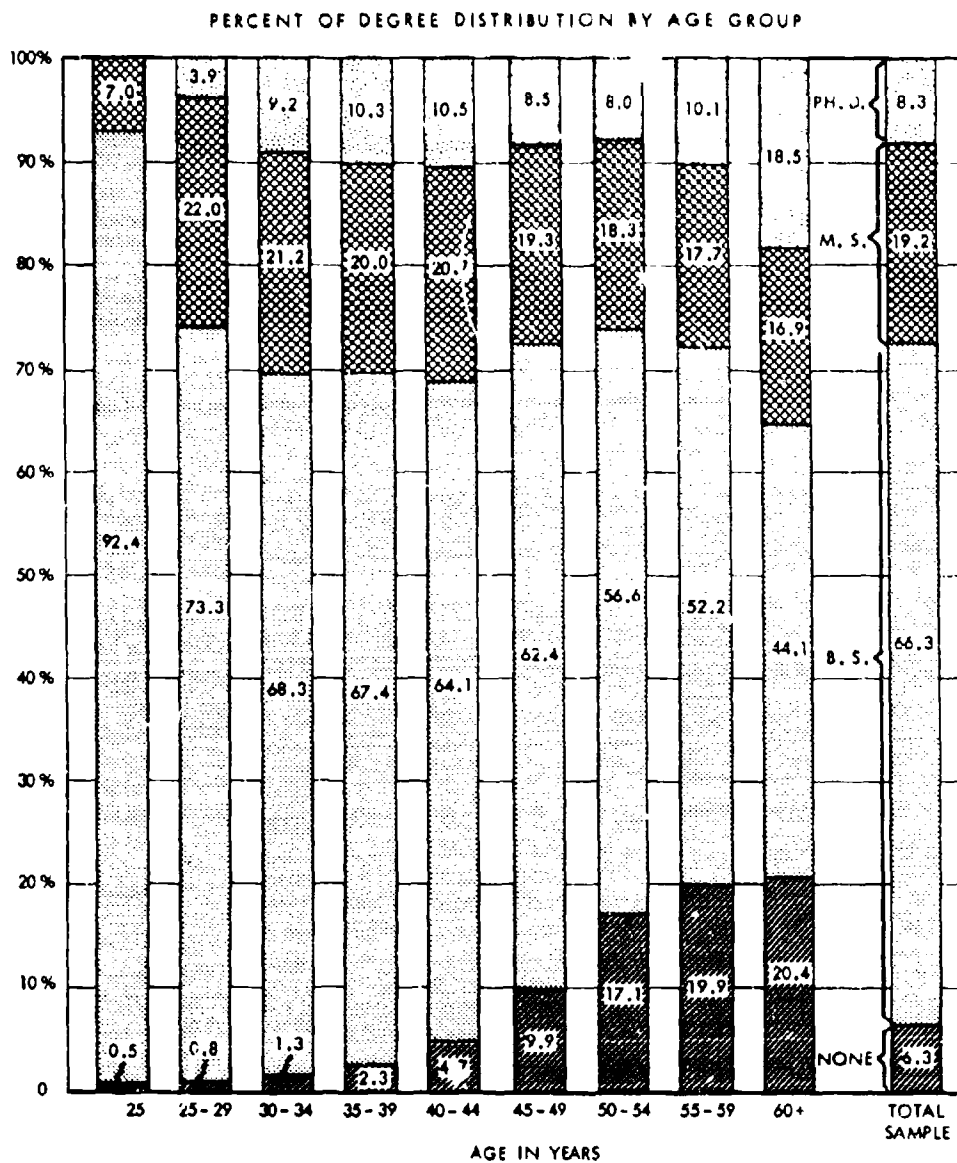
Of those considered S&E professionals, 93.7 percent have at least baccalaureate degrees, and of that number 29.3 percent have advanced degrees. The medical category includes persons with M.D., D.D.S. and D.V.M. degrees.

DEGREE LEVEL



Age

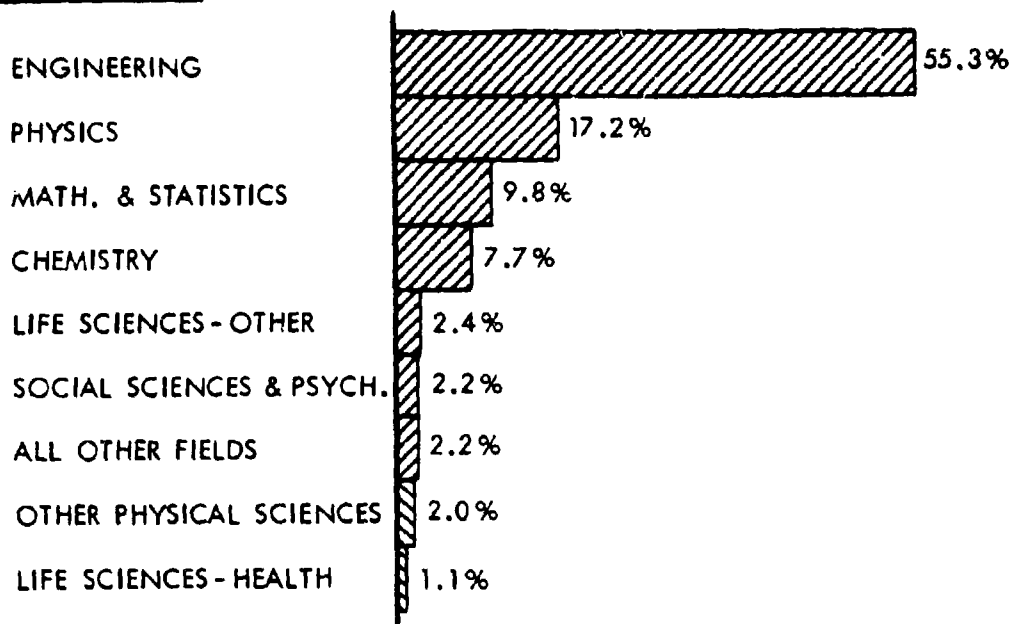
When educational levels are examined by age group, the relative number of no-degree personnel correlates highly with increasing age. The distribution of professionals with advanced degrees is evenly spread over most age groups.



Scientists and Engineers

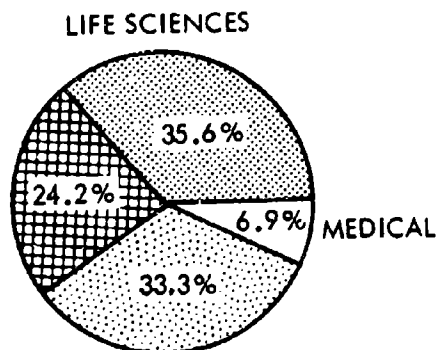
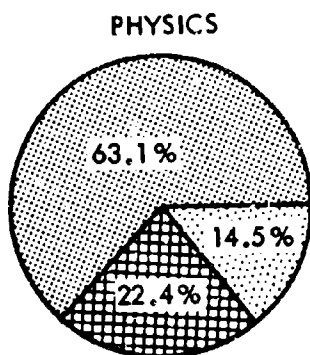
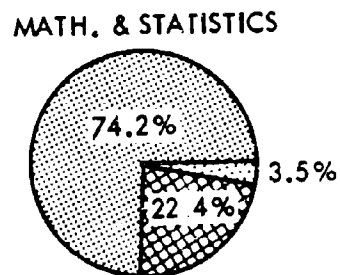
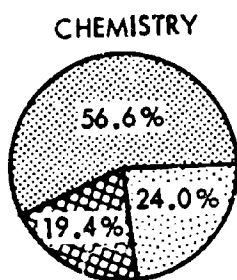
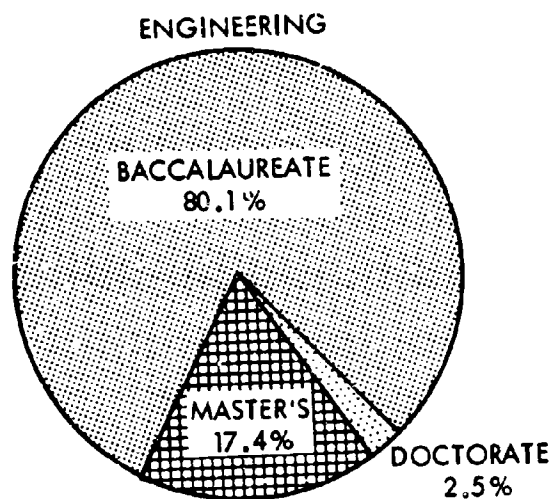
Based on field of degree, 44.7 percent are scientists and 55.3 percent are engineers. Of those who have no degree, only 20.3 percent are working as scientists, while 79.7 percent are engaged in engineering activity.

FIELD OF DEGREE



Most of the scientists, 82.1 percent, are in the physical sciences or mathematics.

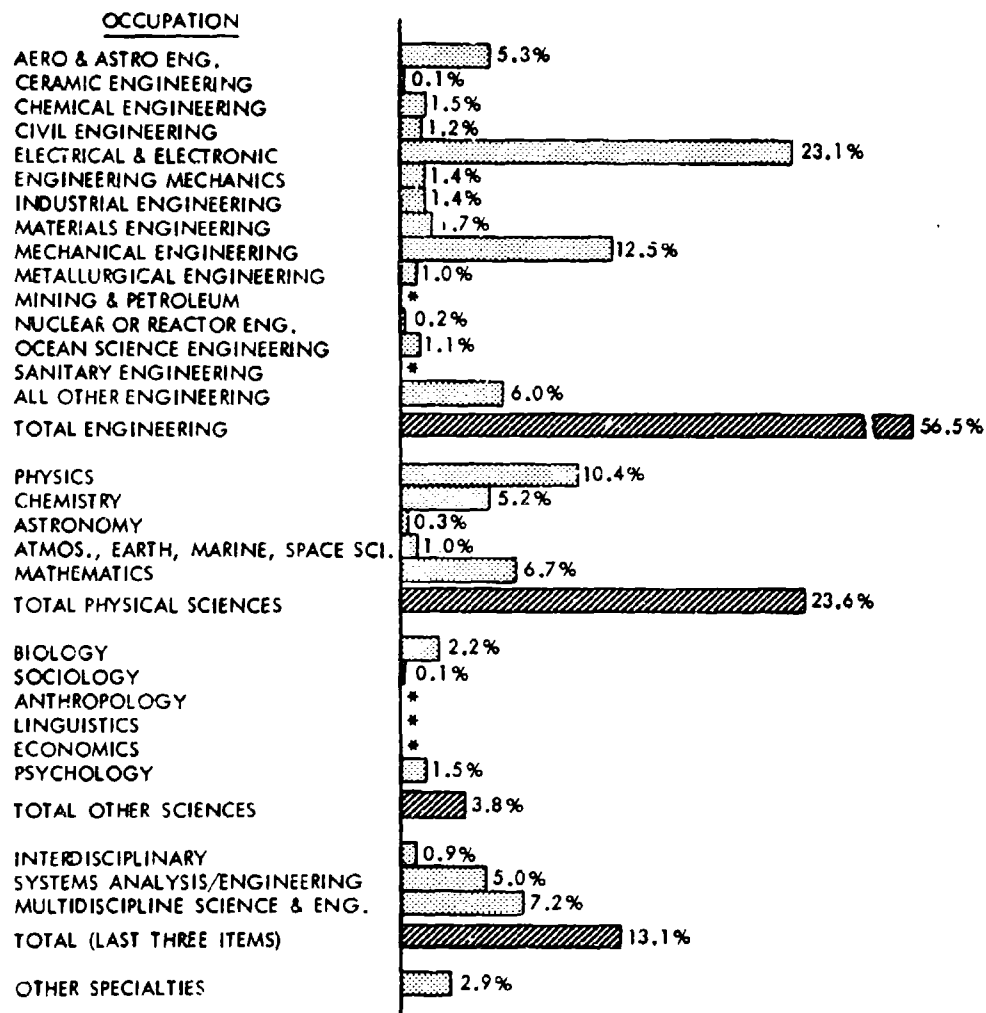
Degree Levels Attained in the Various Fields



MEDICAL

OCCUPATIONS

All types of work done by the personnel surveyed were categorized within a listing of 30 occupations. This compilation includes people with no degree.



*13 OR FEWER DOD S&S PROFESSIONALS

TECHNICAL MOBILITY

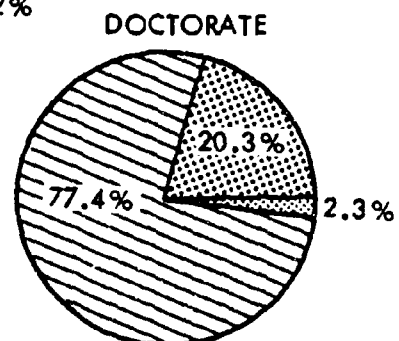
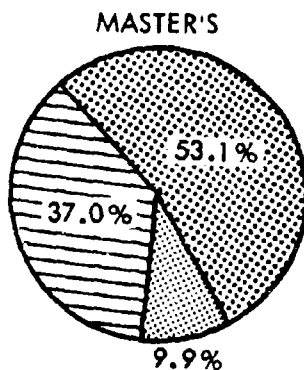
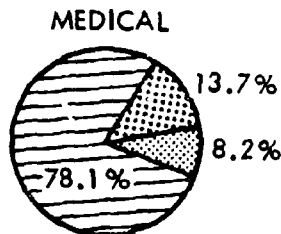
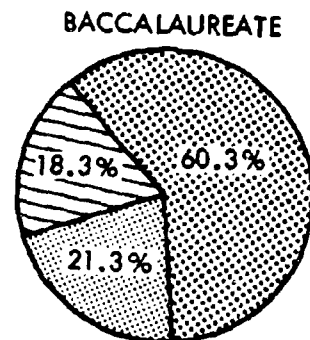
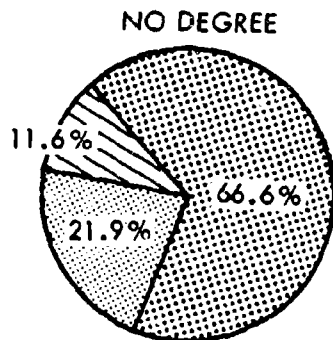
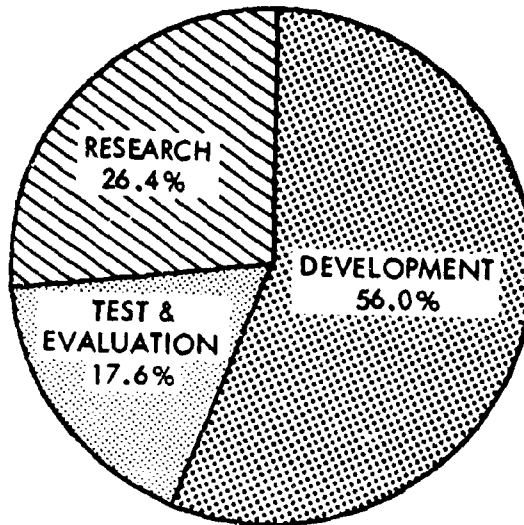
The primary work activity is compared here to the field of highest degree. A significant number of scientists and engineers identify themselves with fields other than those in which they received their academic training. This compilation does not include persons having no degree.

FIELD OF HIGHEST DEGREE VS. PRIMARY WORK ACTIVITY
(Cell percent is based on column sum.)

Primary work activity	Field of Highest Degree								Total	Percentage	
	Engineering	Chemistry	Physics	Other physical sciences	Life sciences (Health-related)	(Other)	Social and behavioral sciences	Mathematics and statistics			All other fields
Aeronautical and astronautical engineering	5.1 1,247	0.6 11	1.2 52	0.6 3	-- --	0.2 1	0.5 3	1.3 32	3.1 15	1,364	5.5
Chemical engineering	2.1 293	4.4 85	0.2 8	0.2 1	0.4 1	0.3 2	-- --	0.1 3	1.0 5	398	1.6
Electrical and electronic engineering	33.4 4,573	1.9 36	14.9 636	4.4 22	2.6 7	0.5 3	3.1 17	5.0 122	11.1 53	5,469	22.2
Mechanical engineering	20.5 2,805	1.1 21	1.7 73	3.0 15	0.4 1	0.5 3	0.9 5	1.4 35	8.6 41	2,999	11.1
Nuclear and reactor engineering	0.2 27	0.6 11	0.4 15	0.2 1	0.4 1	-- --	-- --	0.1 3	0.2 1	59	0.2
Other engineering	23.9 3,267	10.3 197	12.4 531	23.4 118	3.6 10	5.6 34	4.9 27	14.5 350	25.1 120	4,645	18.8
Physics and astronomy	1.2 165	4.1 78	54.1 2,309	13.5 68	1.5 4	0.3 2	0.2 1	3.9 94	5.0 24	2,745	11.1
Chemistry	0.3 37	61.9 1,187	0.3 11	3.6 18	9.8 26	8.6 52	-- --	0.2 5	2.3 11	1,347	5.5
Atmosphere and space sciences	0.1 15	0.3 6	1.7 72	24.8 125	-- --	0.3 2	1.5 8	0.4 10	1.9 9	147	1.0
Biology and agriculture	0.0 1	0.5 9	0.0 1	0.4 2	55.1 146	63.1 383	0.4 2	0.1 2	2.3 11	557	2.3
Social and behavioral sciences	0.0 1	-- --	0.0 1	0.2 1	-- --	1.2 7	73.1 309	0.1 3	2.1 10	422	4.7
Mathematics and statistics	0.2 34	0.5 10	1.5 65	3.2 16	0.8 2	0.5 3	2.6 14	63.7 1,543	8.8 42	1,729	7.0
Other specialties	8.9 1,215	13.9 267	11.6 497	22.8 115	25.3 67	10.7 113	12.0 70	9.1 220	28.5 136	2,700	10.9
Percentage	55.4	7.8	17.3	2.0	1.1	2.5	2.2	9.8	1.9		100.0
Total	13,680	1,918	4,271	505	265	605	546	2,422	478	24,690	

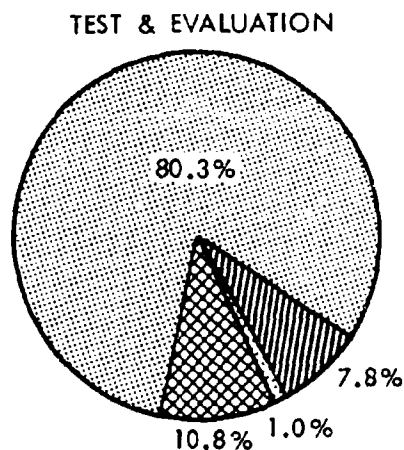
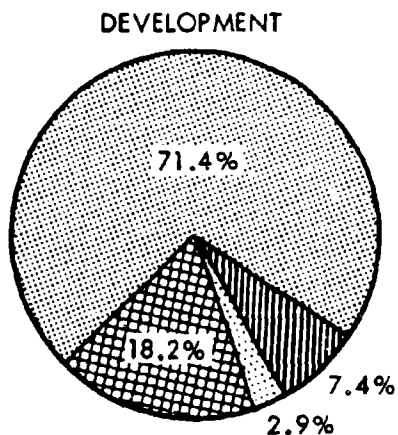
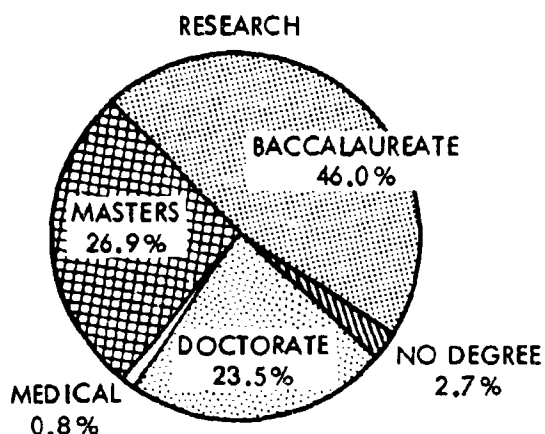
FUNCTIONAL AREA

Over half of the S&E personnel are engaged in development activities, which includes in-house work and technical direction of contracts.

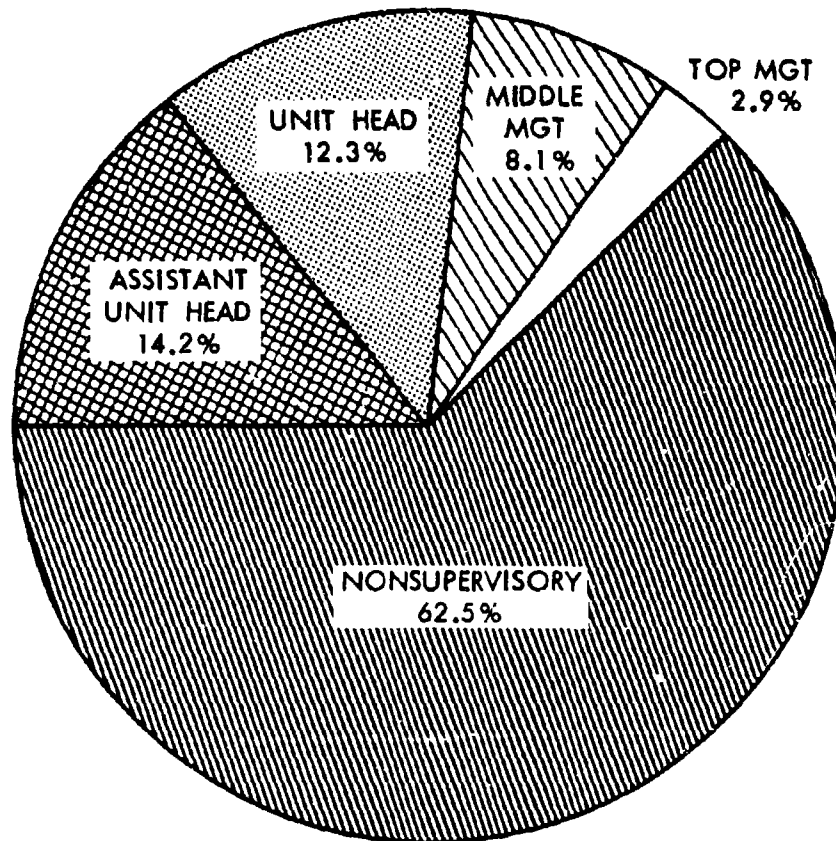


FUNCTIONAL AREA (continued)

The proportion doing research increases with the higher degree levels so that, while less than one-fifth of those with baccalaureate degrees are in research, over three-quarters of those with doctorates or medical degrees are engaged in that type of effort. There is a corresponding factor of 10 difference in the proportion of S&E personnel doing test and evaluation, which is also illustrated by the following charts.



SUPERVISORY LEVELS

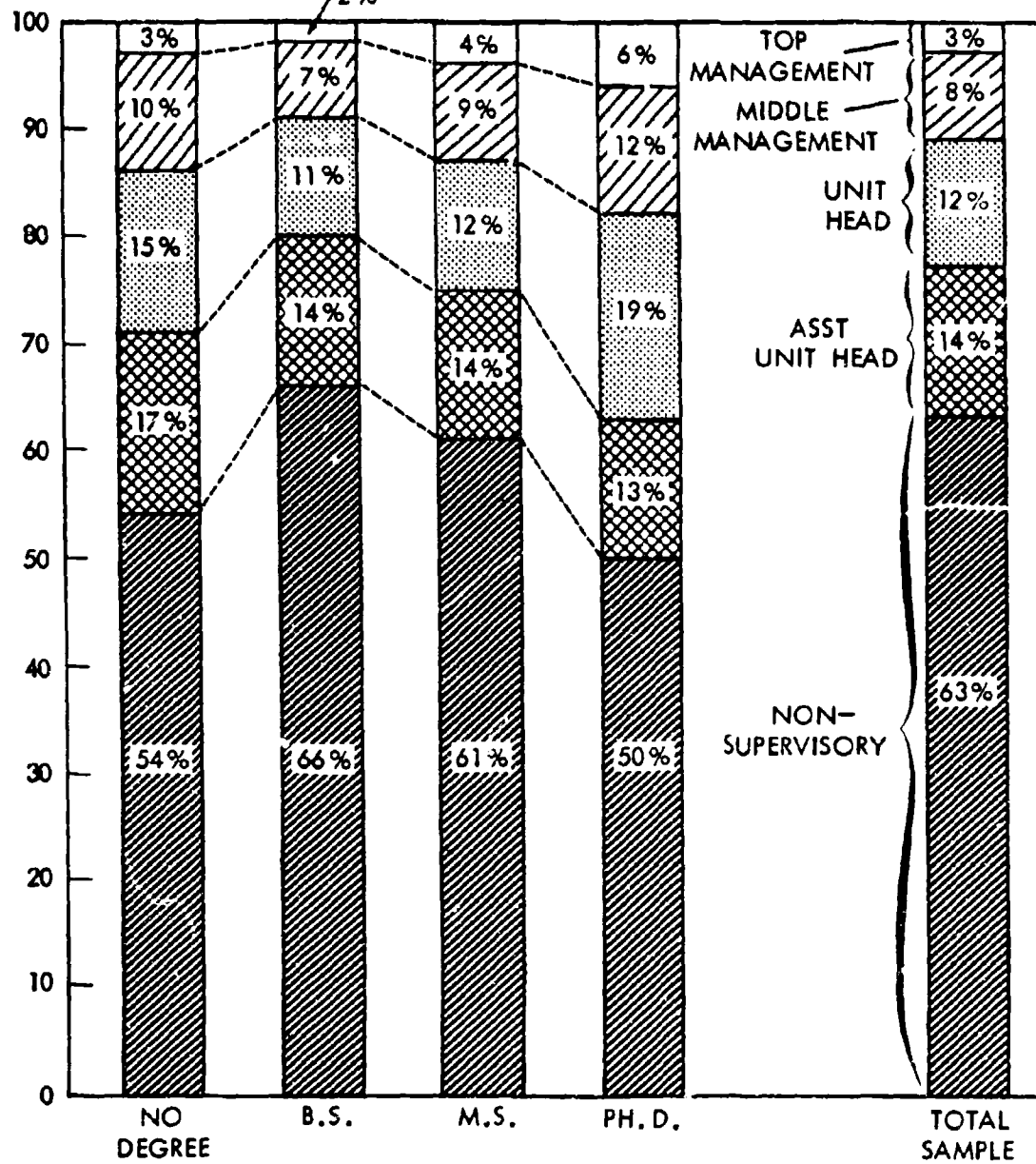


Notes: Assistant unit head—primarily technical supervision.
 Unit head—lowest level for hire/fire recommendation,
 preparation of performance ratings, etc.
 Middle management—administration and direction of several units.
 Top management—staff and policy-making personnel.

There are significant differences in supervisory levels with regard to level of degree. Fifty percent of personnel with doctorates become supervisors, compared to 34 percent of B.S. professionals.

Supervisory Level Vs. Level of Degree

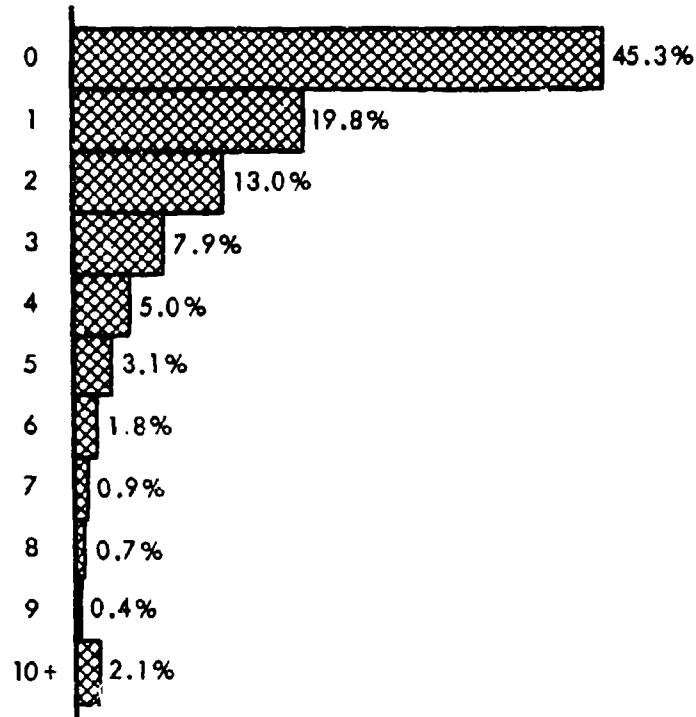
% OF PROFESSIONALS



JOB MOBILITY

Almost half of the DoD civilian scientists and engineers surveyed have worked for no employer other than their current DoD component or activity.

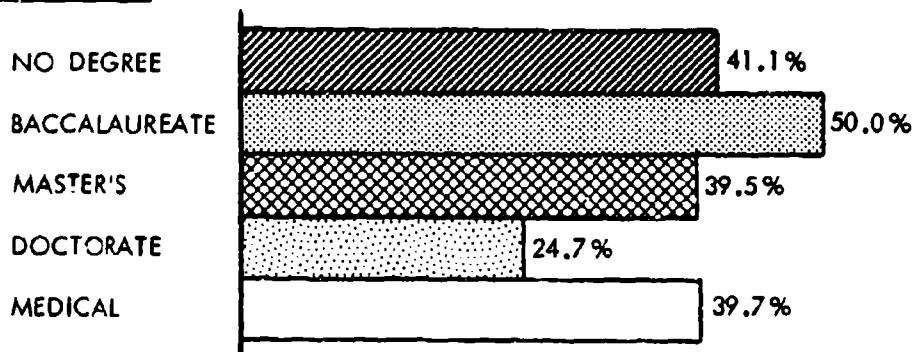
NUMBER OF OTHER JOBS HELD



Personnel with higher degrees, however, are more mobile. Only one-fourth of the doctorate-level personnel had held no other job.

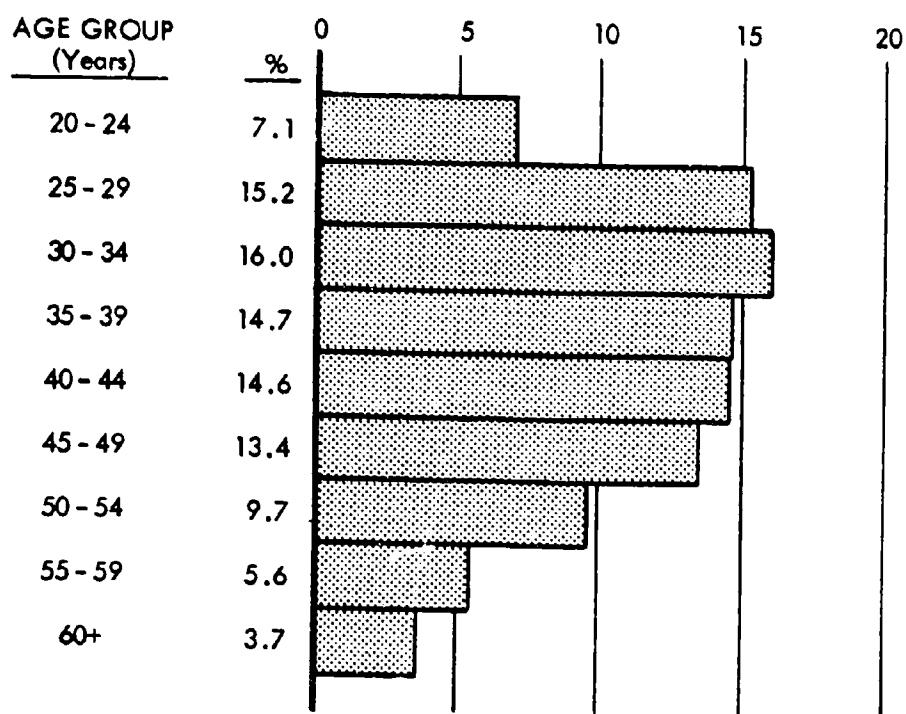
DEGREE LEVEL

% HAVING NO OTHER JOB



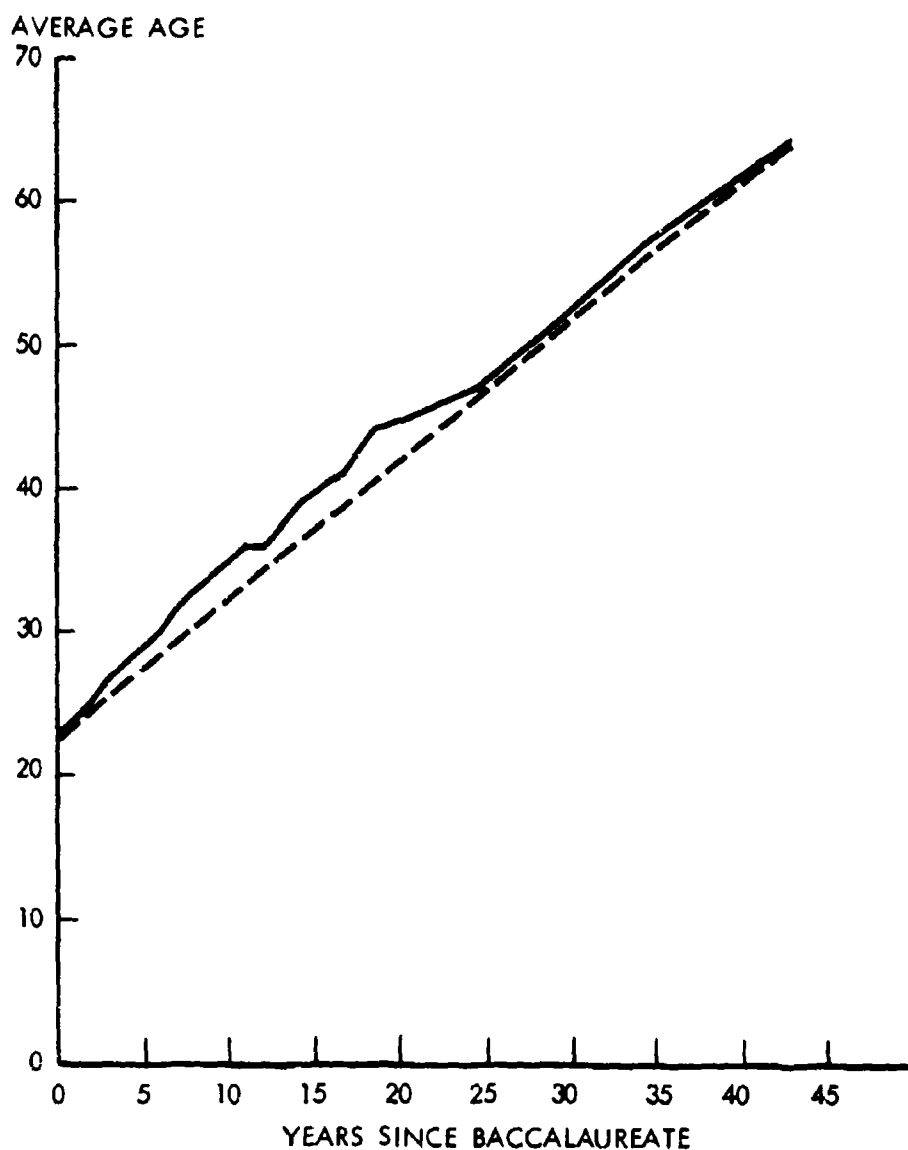
AGE

Of the group surveyed, 53 percent are below 40 and 9.3 percent are 55 or older.



Average Age Vs. Years Since Baccalaureate Degree

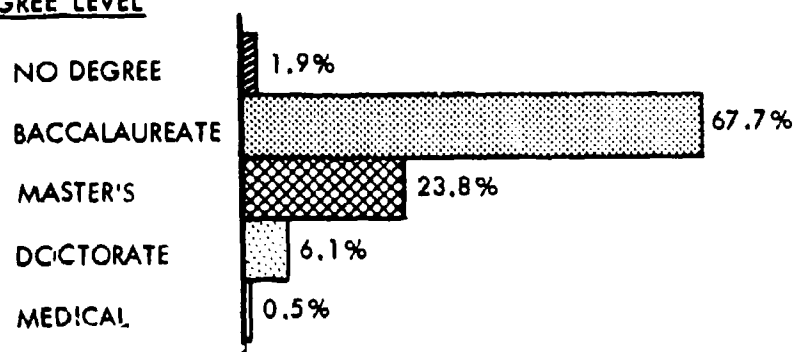
The graph below shows the relationship of age to years since receiving a baccalaureate degree (YSB). The relationship is not uniform, because education in some cases was deferred.



WOMEN IN SCIENCE AND ENGINEERING

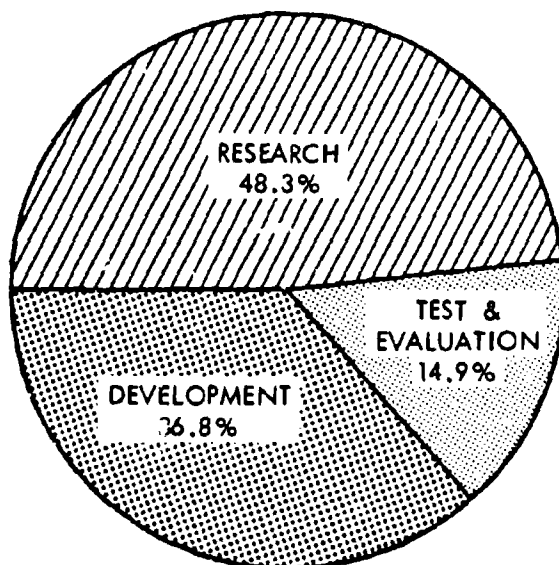
Participating in the survey were 954 civilian women, constituting 3.6 percent of the total S&E personnel surveyed.

DEGREE LEVEL



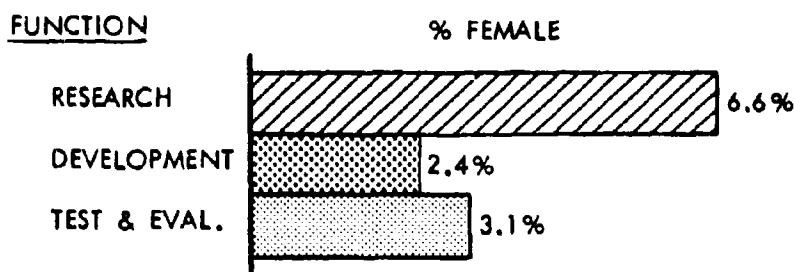
These figures show that the woman in S&E work is more likely to have a degree than a man, and, if she has one, it is slightly more likely to be an advanced degree (31 percent vs. 29.3 percent for men).

Functional Area



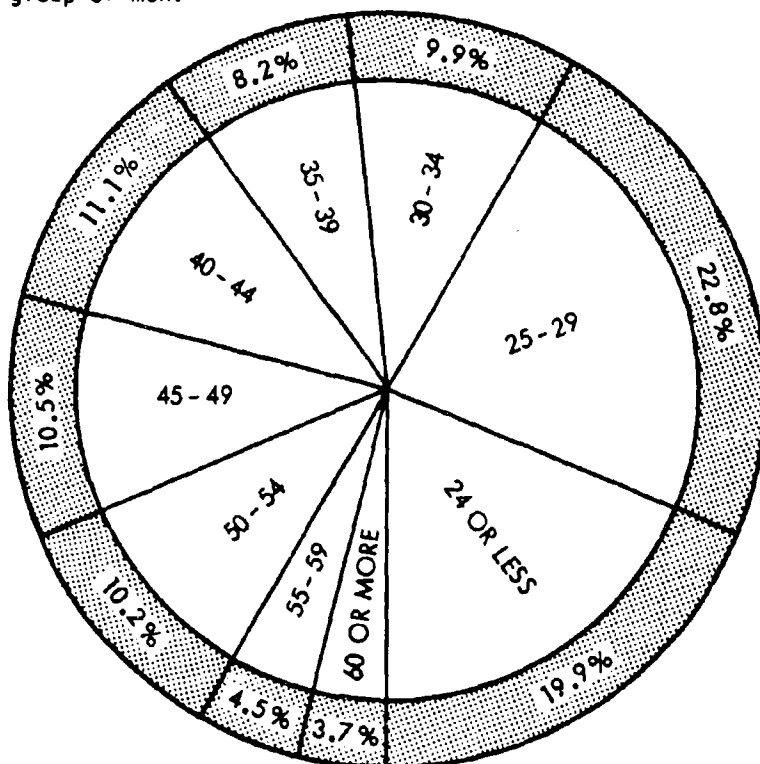
WOMEN IN SCIENCE AND ENGINEERING (continued)

Almost half of the women are in research, as compared to about one-fourth of the men. Research is the only functional area in which women comprise a really significant portion of the work force.



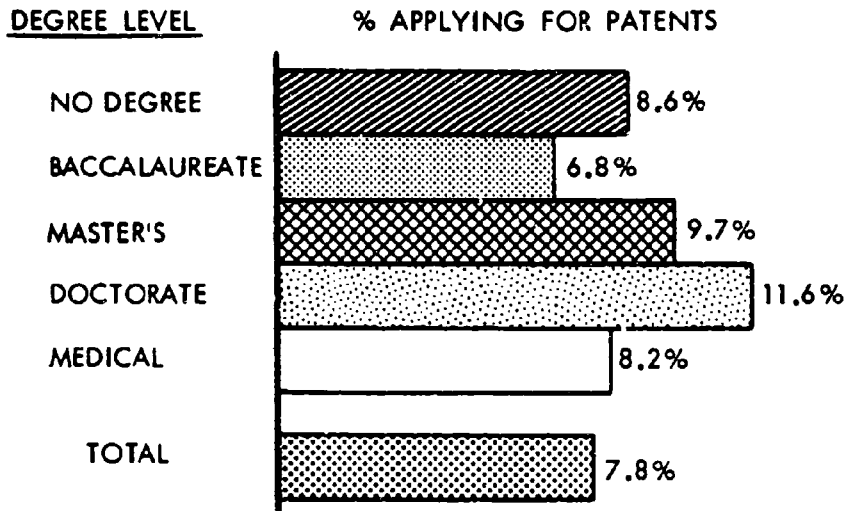
Age

The age of 51.8 percent of the women is less than 35. Only 38.3 percent of the men are in this age range. Of the women, 8.1 percent are 55 or older; this figure is 1 percent less than that for the corresponding group of men.

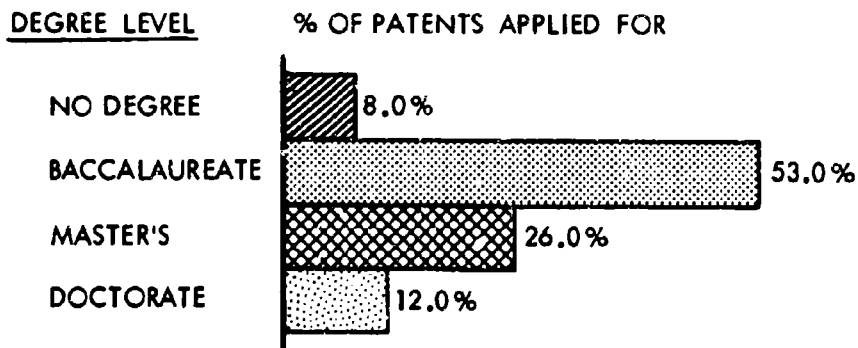


PATENT APPLICATIONS

Holders of advanced degrees are more likely to apply for patents than people who have baccalaureate degrees.

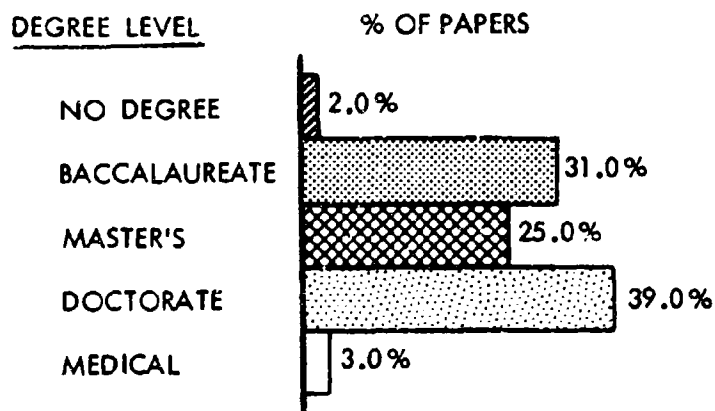
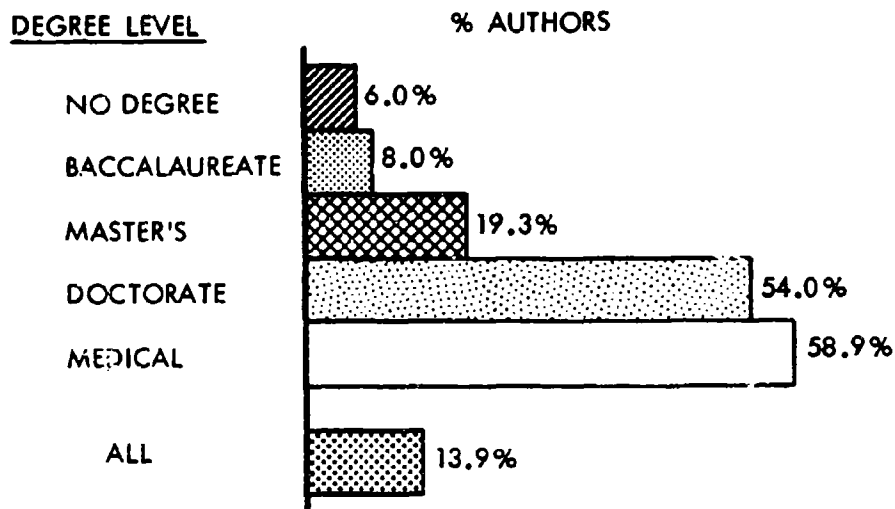


Because of their greater number, however, holders of baccalaureate degrees apply for more patents.



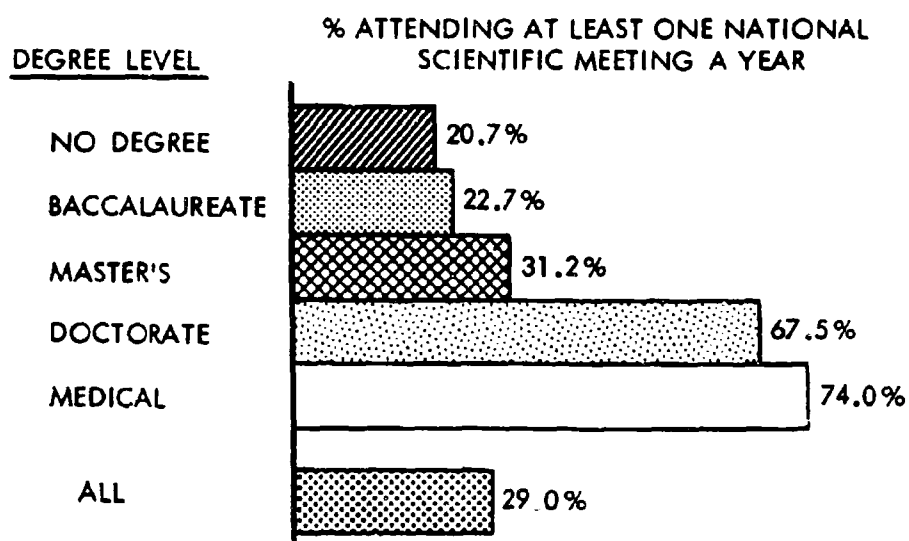
PAPERS PUBLISHED

Of the DoD S&E personnel surveyed, 13.9 percent were authors of at least one published paper. There was an average of 2.2 papers per author. Holders of doctorates not only participated in high proportions but, with 38 percent of all papers, were actually more prolific authors than those at any other degree level.



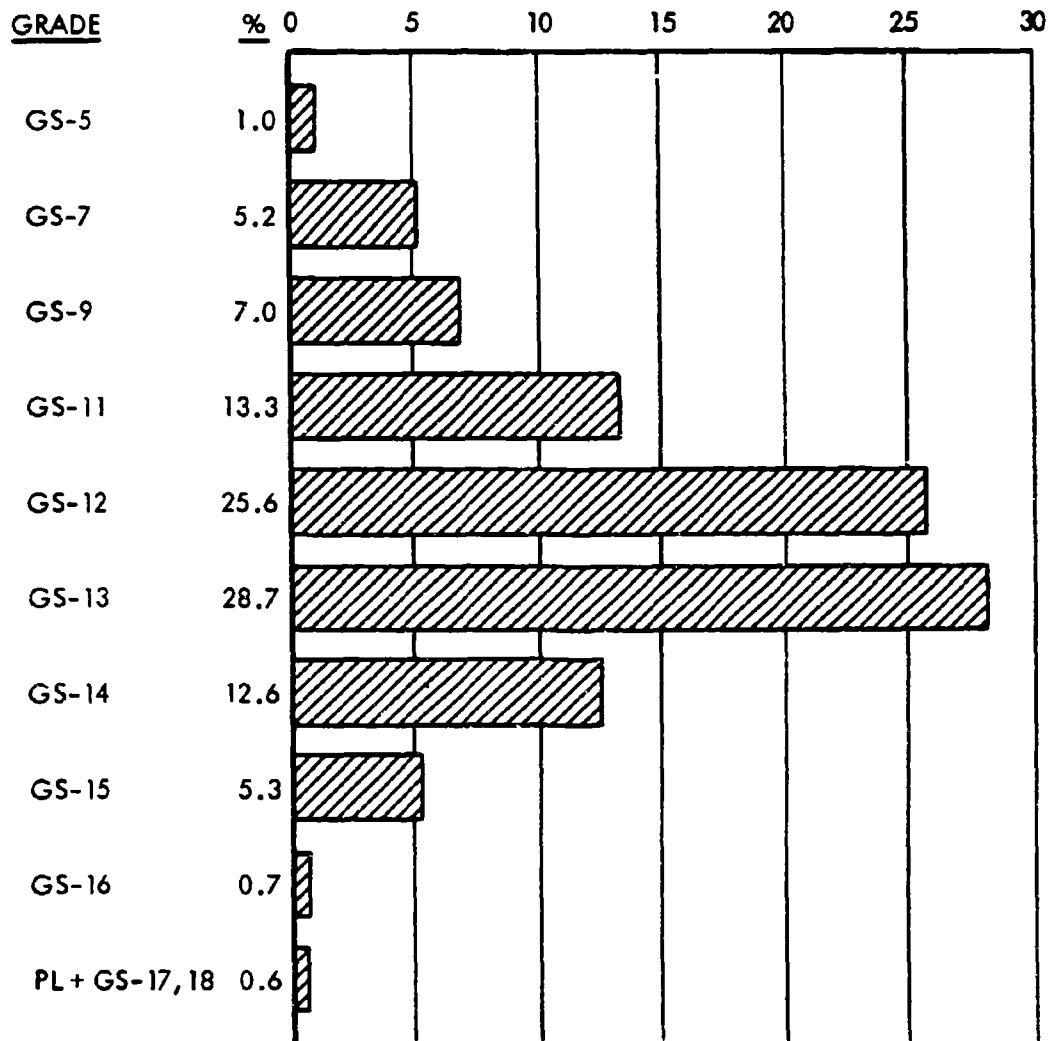
ATTENDANCE AT NATIONAL SCIENTIFIC MEETINGS

About one scientist or engineer in four goes to a meeting of a scientific society each year. Almost two-thirds of those with doctorates and three-fourths of those with medical degrees attend a national meeting each year.



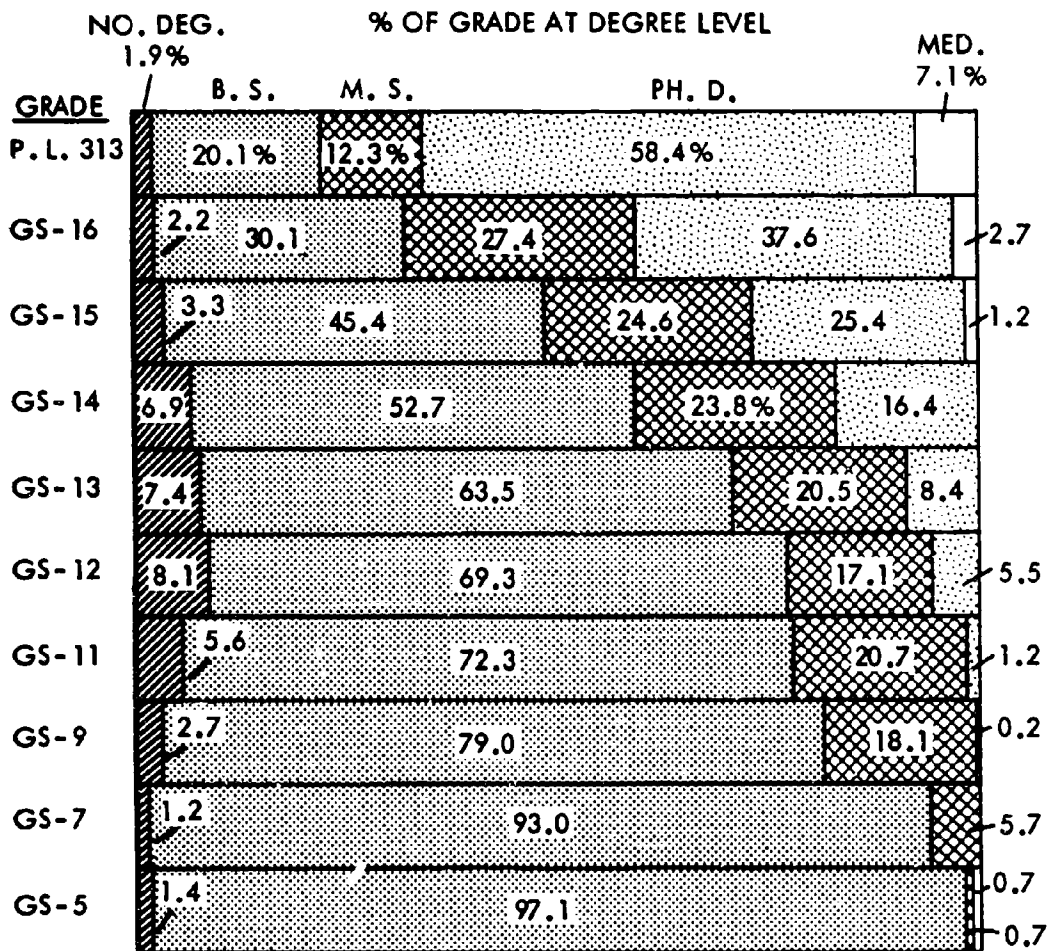
GRADE DISTRIBUTIONS

Slightly over 50 percent of the S&E personnel surveyed are at or below the GS-12 grade level. Over half of them are GS-12's or GS-13's. More than three-quarters are in grades GS-11 through GS-14, and about one-fifth are at GS-14 and above.



Grade—Degree Level

Over 65 percent of the personnel at the grade level of Public Law 313 have doctorates. At and above the GS-15 level, over half have advanced degrees.



Age—Grade

In the group surveyed, 43.2 percent of the GS-13's are under 40 years of age, compared to 53 percent of the total sample. However, 81.8 percent in grades GS-14 and above are over 20 years of age.

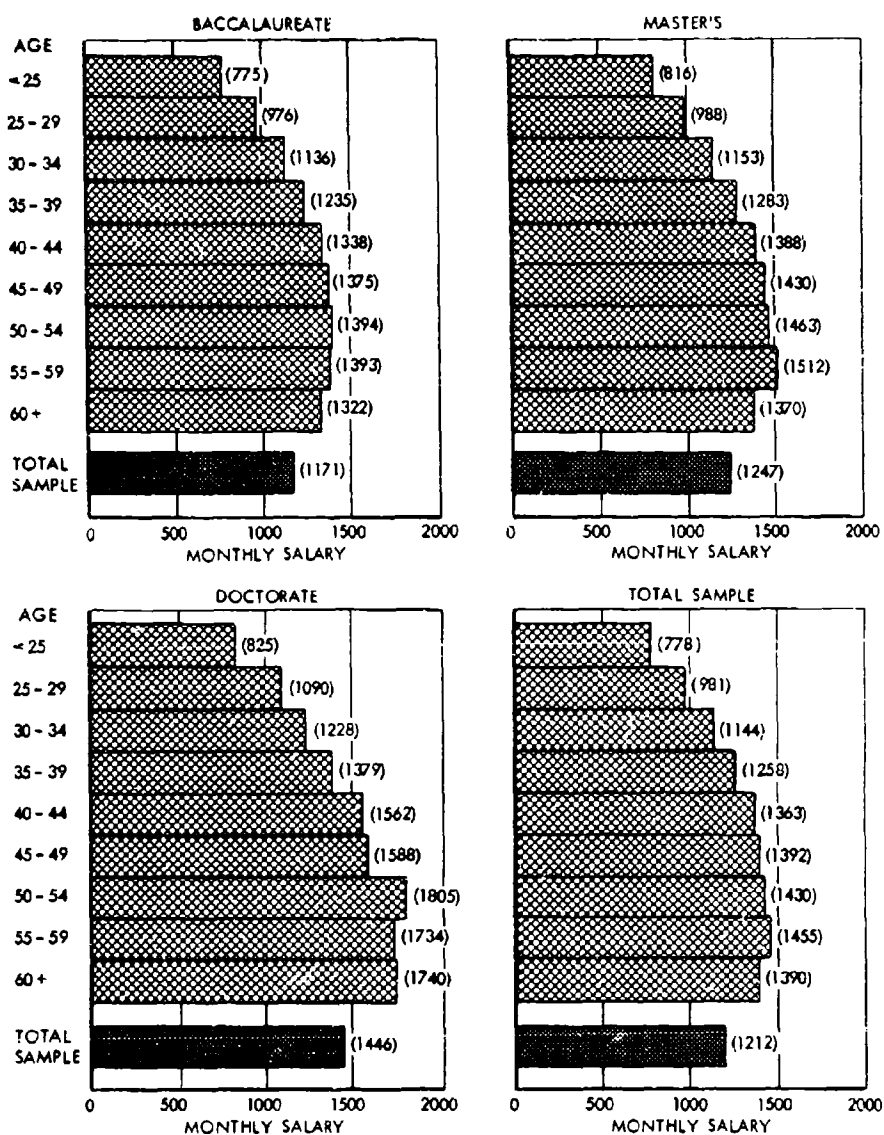
AGE—GRADE DISTRIBUTION
(Cell percent is based on column sum.)

Age (yr)	PL-313	GRADE										Total	Percentage
		GS-18, 17	GS-16	GS-15	GS-14	GS-13	GS-12	GS-11	GS-9	GS-7	GS-5		
<25	--	--	--	0.1	--	--	0.0	3.5	29.8	70.1	85.2	--	--
				1			1	124	547	953	236	1,862	7.1
25-29	0.6	--	--	0.1	0.1	2.8	17.1	41.7	45.7	21.6	10.5	--	--
	1			2	4	207	1,158	1,463	840	293	29	3,999	15.2
30-34	--	--	--	1.6	6.4	19.2	24.6	17.5	10.1	4.0	2.5	--	--
				22	213	1,456	1,659	615	187	54	7	4,213	16.0
35-39	1.9	--	2.2	7.3	17.2	21.2	16.9	10.0	4.4	1.7	0.7	--	--
	3		4	102	572	1,608	1,140	350	81	23	2	3,885	14.7
40-44	10.4	9.1	10.8	22.9	23.3	19.3	12.9	8.6	3.0	1.1	0.4	--	--
	16	1	20	321	775	1,464	872	301	56	15	1	3,842	14.6
45-49	20.8	36.4	25.9	26.7	23.9	16.3	11.5	6.6	2.5	0.4	--	--	--
	32	4	48	375	776	1,233	775	231	46	5	--	3,345	13.4
50-54	29.9	18.2	28.6	23.7	15.4	10.8	8.3	5.5	2.0	0.6	0.7	--	--
	46	2	53	333	512	822	561	193	36	8	2	2,568	9.7
55-59	16.9	36.4	18.9	11.5	9.3	6.3	4.8	3.7	0.9	0.4	--	--	--
	26	4	35	162	310	481	322	128	17	6	--	1,491	5.6
60+	19.5	--	13.5	6.1	4.4	4.0	3.9	2.9	1.5	0.1	--	--	--
	30		25	85	146	304	265	101	28	2	--	986	3.7
Percentage	0.6	0.0	0.7	5.3	12.6	28.7	25.6	13.3	7.0	5.1	1.0	100.0	
Total	154	11	185	1,403	3,328	7,577	6,753	3,506	1,838	1,359	277	26,391	100.0

MEDIAN SALARIES

The median monthly salary of personnel with M.S. degrees is 6.5 percent greater than that of holders of B.S. degrees. Ph.D.'s exceed B.S. salaries by 23.5 percent. Salaries increase with age at least up to 50 years of age.

MEDIAN MONTHLY SALARY BY AGE AND DEGREE LEVEL
(Nos. in () represent actual values)



MEDIAN SALARIES (continued)

B.S. and M.S. Degrees: Engineers receive higher salaries than people in other disciplines. Their salaries exceed those of chemists by 2.2 percent for B.S. and 1.8 percent for M.S. degrees. The median salaries of life scientists (health and related areas) are the lowest in the disciplines compared; engineers' salaries exceed theirs by 25.3 percent for B.S. and 22.2 percent for M.S.

Ph.D. Degrees: Mathematicians receive the highest median salary of all disciplines compared. The second highest, which is 8.9 percent lower, is that of physicists.

The higher degree levels indicate the higher median salaries in all disciplines.

